

SOUTHWEST FISHERIES SCIENCE CENTER

NATIONAL MARINE FISHERIES SERVICE SOUTHWEST FISHERIES SCIENCE CENTER P.O. BOX 271 LA JOLLA, CA 92038

SEPTEMBER 1996

Library
NOAA, National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

NORTHERN ELEPHANT SEALS AT AÑO NUEVO DURING THE BREEDING SEASONS OF 1992-1996

By

Burney J. Le Boeuf

This Administrative Report is issued as an informal document to ensure prompt dissemination of preliminary results, interim reports and special studies. We recommend that it not be abstracted or cited.

NORTHERN ELEPHANT SEALS AT AÑO NUEVO DURING THE BREEDING SEASONS OF 1992-1996

Burney J. Le Boeuf

Department of Biology & Institute of Marine Sciences

University of California

Santa Cruz, California 95064

Final Report

to

National Marine Fisheries Service

Southwest Fisheries Science Center

18 JULY 1996

ADMINISTRATIVE REPORT LJ-96-12C

This report was prepared by B. J. Le Boeuf under contract No. 40JGNF600229 from the National Marine Fisheries Service, Southwest Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, CA 92037-1508. The statements, findings, conclusions and recommendations herein are those of the author and do not necessarily reflect the views of the National Marine Fisheries Service. Jay Barlow of the Southwest Fisheries Science Center served as Contract Officer's Technical Representative for this contract.

TABLE OF CONTENTS

Page

ABSTRACT 3

INTRODUCTION..... 3

METHODS 3

RESULTS 4

DISCUSSION 6

ACKNOWLEDGEMENTS 6

LITERATURE CITED 6

ABSTRACT

The aim of this study was to estimate pup production of northern elephant seals, *Mirounga angustirostris*, from breeding season censuses of the Año Nuevo colony during the years 1992 to 1996. Counts were made daily throughout the breeding season from blinds, promontories, or by walking through the rookery. Estimates of births ranged from 2183 to 2861. Counts of pups weaned ranged from 2029 to 2333. Both measures increased over the study period but not linearly. Although the island has reached carrying capacity, it is expected that the mainland segment of the population will continue to increase in the near future.

INTRODUCTION

The aim of this report is to describe the results of counts of northern elephant seals at Año Nuevo State Reserve during the breeding seasons of 1992-1996 and to estimate the number of pups produced annually. These data, and similar data from other northern elephant seal rookeries, will make it possible to estimate the size and recent growth of the northern elephant seal population.

Since the nadir of the population in 1892, when as few as 30 seals may have existed (Hoelzel et al. 1993), the northern elephant seal population has been increasing in number and range. The entire elephant seal population was estimated to number 127,000 in 1991 and was increasing at the rate of 6% annually (Stewart et al. 1994). Growth of the colony at Año Nuevo has been less rapid than that of colonies in southern California such as San Miguel and San Nicolas Islands.

METHODS

Censuses were conducted on both the island and the mainland from early December to mid-March during the years 1992 to 1996. Counts were made daily, except in bad weather, from a promontory or a blind or by walking among the animals. The seals were categorized as follows:

breeding age males - males varying in age from 5 to 14 that were present and competing for females during the breeding season; adult females - all females, 3 to 20 years old, gathered in harems during the breeding season; pups - neonates, 1 to 30 days old, with black coats that were suckling females in harems; weanlings - seals, one to 3 1/2 months old, with newly-molted, silver coats, most of whom are found outside of harems; and juveniles - seals, 1 to 4 years old, resting outside harems.

It was assumed, based on observations dating back to 1968, that 97% or more of the females that appear during the breeding season, give birth to a single pup.

RESULTS

Counts and estimates of northern elephant present at Año Nuevo during the breeding season are shown in Table 1.

Adult males. Peak census of males on the rookery fluctuated between 523 and 747 during the study period, being lowest in 1996. This is minimal estimate of males associated with the rookery. Because some males are in the water, this number underestimates the total number of males present at the time. Because numerous males have been observed, marked, and then leave the rookery, this number is a substantial underestimate of the number of adult males that were present during the entire breeding season and that were potentially in competition for females.

Adult females. Peak census of females on the rookery was lowest in 1993 and highest in 1995. The peak census of adult females is a good estimate of maximum females present on the rookery at the time because females do not lounge in the water as males do. The peak census at Año Nuevo is between 26 January and 2 February. This number, however, underestimates the number of females that used the rookery and gave birth during the breeding season because some females wean their pups and leave the rookery before others arrive and give birth.

Short of marking all females as they arrive, which is not practical on a large rookery, and may itself affect female counts, the number of females that give birth during a breeding season must be estimated. The total number of females that were present at Año Nuevo each breeding season (c) was calculated as follows: the peak census (b) was augmented by the number of females present 33 days before peak census (to account for the number of females that weaned their pups and had already left the rookery) and 33 days after peak census (to allow for the number of females that remain to arrive and give birth). This number varied from a low of 2251 in 1993 to a high of 2950 in 1995.

Pups born. The peak count of suckling pups (d), which occurs near the peak count of adult females, is a substantial underestimate of total births. This number increased from a low 1465 in 1992 to a high of 1703 in 1996.

An estimate of total births (e) is derived by reducing the total estimated females (c) by 3%, i.e., our best estimate of the percentage of females that were present but did not give birth. This number ranged from a low of 2183 in 1993 to a high of 2861 in 1995.

Pups weaned. The census of suckling pups and weanling on 2 or 3 March (h) is our best estimate of pups produced, i.e., pups of the year that survived to weaning age. This is the maximum number of weanlings and suckling pups counted. After this date, weanlings begin to move into the water and from the island to the mainland and counts of pups and weanlings decrease. Pups weaned was lowest in 1993 and highest in 1995.

Pup mortality. Pup mortality on the rookery prior to weaning (i) is estimated by subtracting the census of pups and weanlings (h) from the estimate of pups born (e), i.e., estimated pups born minus pups weaned. This number varied from a low of 154 in 1993, a mortality rate of 7% of total births, to a high of 529 in 1995, a mortality rate of 18.5%. In every year, the mortality rate was greater on the island than the mainland.

DISCUSSION

The colony of elephant seals at Año Nuevo continues to increase whether measured by total births per year or pups produced (weaned) per year. Up to 2861 pups are born annually and up to 2333 pups are weaned. The increase, however, has not been not been linear. For example, total births were lower than expected in 1993 and peaked in 1995 only to decline again in 1996. Wide variation in pup mortality prior to weaning, especially on the island, has led to fluctuations in pups weaned. It is clear that the island has reached carrying capacity; the pup mortality rate, and hence, pups weaned, can be expected to vary greatly with weather at peak season (Le Boeuf and Briggs 1977). Given the space available, I foresee no decrease in the growth of the mainland segment of the population in the near future.

ACKNOWLEDGMENTS

I thank numerous graduate and undergraduate students for conducting censuses during the study period. This research was conducted under permits from the Año Nuevo State Reserve and National Marine Fisheries Service (no. 836).

LITERATURE CITED

- Le Boeuf, B.J. and K.T. Briggs. 1977. The cost of living in a seal harem. *Mammalia* 41: 167-195.
- Hoelzel, A.R., J. Halley, S.J. O'Brien, C. Campagna, T. Arnborn, B. Le Boeuf, K. Ralls, and G.A. Dover. 1993. Elephant seal genetic variation and the use of simulation models to investigate historical population bottlenecks. *The Journal of Heredity* 84: 443-449.
- Stewart, B.S., P.K. Yochem, H.R. Huber, R.L. DeLong, R.J. Jameson, W.J. Sydeman, S.G. Allen and B.J. Le Boeuf. 1994. History and present status of the northern elephant seal population. Pp

29-48 *In* B.J. Le Boeuf and R.M. Laws. Elephant Seals: Population Ecology, Behavior and Physiology. University of California Press, Berkeley.

Table 1. Censuses and estimates of northern elephant seals at Año Nuevo during the breeding seasons, 1992-1996.

		a		b		c		d		e		f		g		h		i	
		Adult males		Adult females		Pups		Weanlings		Pups & Weaners		Pup mortality							
		Peak Census	Total Estimated	Peak Census	Total births Estimated	Census on 2 or 3 March	Census on 2 or 3 March	Census on 2 or 3 March	f + g	e - h									
1992	Island	107	742	320	720	20	510	530	190										
	Mainland	447	1665	1145	1615	43	1490	1533	82										
	Both	554	2407	1465	2335	63	2000	2063	272										
1993	Island	99	526	311	510	10	408	418	92										
	Mainland	583	1725	1175	1673	49	1562	1611	62										
	Both	682	2251	1486	2183	59	1970	2029	154										
1994	Island	148	732	325	710	15	606	621	89										
	Mainland	438	1819	1196	1764	63	1578	1641	123										
	Both	586	2551	1521	2474	78	2184	2262	212										
1995	Island	152	705	245	683	20	226	246	438										
	Mainland	595	2245	1410	2178	99	1988	2087	91										
	Both	747	2950	1655	2861	119	2214	2333	529										
1996	Island	119	722	443	700	17	524	541	159										
	Mainland	404	1875	1260	1819	89	1638	1646	135										
	Both	523	2597	1703	2519	106	2162	2187	294										

